

initial stages and advance quickly to simple rider work. There are four main sections in the book; each of these starts with an experimental investigation and ends with the theoretical treatment of the corresponding theorems. There are abundant numerical examples, but some teachers will consider that the supply of riders is inadequate. An excellent innovation is the insertion of circle properties before areas are dealt with. This provides such an excellent field of simple and interesting riders that it is surprising that the Euclidean order has been followed so long. The last section contains as many of the theorems on ratios as are usually given in elementary text-books, the numerical examples, illustrating the use of proportion, are particularly good.

(4) The analytical geometry of the conic is treated in this volume in less detail than is usual in most text-books. For practical purposes, it is far more important for the student to acquire a correct appreciation of the principles which obtain for curves of any degree, and to master the use of infinitesimal methods. The author has therefore employed the calculus freely and applied it both to plane and skew curves and simple surfaces. The examples have been chosen rather to elucidate principles than to test analytical dexterity. The book may be used with confidence by engineering students, with whose needs it is primarily concerned.

#### SCIENCE AND SPECULATION.

*The World of Life: a Manifestation of Creative Power, Directive Mind, and Ultimate Purpose.* By Dr. A. R. Wallace, F.R.S. Pp. xvi + 408. (London: Chapman and Hall, Ltd., 1910.) Price 12s. 6d. net.

THE appearance of a new book written by the veteran naturalist in his eighty-eighth year cannot fail to arouse the interest of a wide circle of readers. The work may indeed be regarded as a recapitulation of the opinions on a great variety of topics which, during a long and active literary career, extending over more than fifty years, Dr. Alfred Russel Wallace has put forth in a number of memoirs, books, and magazine articles. But to regard the work as a mere summary of the results of former labours would be to do a great injustice to its author; for there is scarcely a subject referred to in it, in which fresh facts, novel lines of reasoning, or suggestive conclusions are not presented for our consideration.

The book naturally divides itself into two portions, which are of very diverse character and unequal value and importance. As regards the first part, we must state at once that the space at our disposal is altogether insufficient to enumerate—much less to discuss—the numerous interesting problems suggested in it.

After a first chapter, devoted to a somewhat academical discussion of the nature and origin of life, we have five chapters treating on the subject with which Dr. Wallace's name will always be so honourably associated—the distribution of plants and animals. Readers familiar with the author's great work on this subject, and with his "Island Life," will be surprised and delighted to find how many

novel facts and lines of treatment have suggested themselves to the author since the publication of his earlier works. Among many interesting discussions in this part of the book we may specially instance the contrasts pointed out between the more uniform floras of temperate climes and the richly diversified floras of tropical lands. These latter are shown in many cases to be in great danger of extinction through human agencies, and the interesting suggestion is made that the British Government might follow the example of the Dutch in Java, by establishing small forest reserves in our tropical colonies; such reserves, Dr. Wallace points out, need not be of anything like the extent of the animal reservations of North America and Africa, for, owing to the crowded and diversified nature of all parts of a tropical forest, small areas of even a square mile would be sufficient for the purpose.

Later chapters devoted to illustrations, extensions, and new applications of the theory of natural selection cannot fail to arrest the attention of all naturalists; we may especially refer to the discussion of "recognition marks," and those on bird life, bird migration and extinction, and the relations of bird to insect life. We may note that even when the author feels compelled to express dissent from the views of Darwin—as in his ideas concerning the origin of man's intellectual and moral faculties—we find his loyalty and devotion to his old friend and fellow-worker displayed as conspicuously as ever.

The three chapters on the geological record, well illustrated as they are by wood-cuts drawn from various sources, abound with interesting observations. We may instance his development of the ideas put forward by Dr. Smith Woodward, in an address to the British Association, concerning the tendency of groups of animals in the periods before their final extinction to run into extravagant and sometimes *bizarre* forms. This is illustrated in the case of the trilobites and ammonites.

Later chapters on the relations of the chemical elements to vital agencies, on the "mystery of the cell," on the parts played by plants, animals, and man respectively in the economy of nature, are eloquent and illuminating; but it is unfortunate that the author is never able to avoid the pitfalls of teleological speculation. This tendency is still more strikingly manifested when the author proceeds to discuss such questions as the existence of pain in the lower animals, of the non-justifiability of vivisection, of the remedies for the overcrowding of cities, and similar problems of the day. On all these and similar questions Dr. Wallace writes very confidently, sometimes intruding his speculative opinions in the midst of the treatment of purely scientific questions.

Most of the author's scientific friends—and they are very numerous—will feel regret that these and similar discussions were not reserved for a separate volume. We are all familiar, from reading his "Man's Place in the Universe," and his autobiographical work—"My Life"—with the author's peculiar views on extra-scientific, social, and political questions. Some of these tendencies to unbridled speculation seem to have reached an extreme limit in the twilight of a noble life, as when it is gravely suggested to sub-

stitute for the idea of a single Creator, orders of angelic beings, each charged with the task of originating and exercising supervision and control over special evolutionary processes! Everyone must feel how incongruous are such incursions into the realms of the unknown and the unknowable with the really valuable and suggestive discussions of the first part of the book. But however much we may regret the intrusion by the author of these wild speculations, and greatly as we may dissent from his social and political panaceas, as hopelessly impracticable, we all recognise that they are inspired by the author's love of humanity and all living things, by a desire to ameliorate the sorrows and sufferings he sees around him, and by a hope—ill-founded though it may be—that such teachings may be of service to his fellow-men.

#### NATIVES OF THE ARGENTINE REPUBLIC.

*Los Aborígenes de la República Argentina. Manual adaptado á los programas de las Escuelas Primarias, Colegios Nacionales y Escuelas Normales.* By Prof. F. F. Outes and Prof. C. Bruch. Pp. 149. (Buenos Aires: Angel Estrada y Cia., 1910.)

THIS neat little book, well printed and illustrated, far surpasses its modest subtitle: a manual adapted to the teaching in primary and secondary schools. It is really a condensed account of what is known of the natives of the Argentine Republic, of those who are quite prehistoric, those who were found at the time of the conquest by the Spaniards, and those who "still survive precariously in some far-off districts."

A rapid survey of the earth's history as told by the sedimentary strata and their leading fossils is made the occasion for explaining the meaning of the many indispensable technical terms. Since much of the evidence of the existence of prehistoric man rests upon his primitive implements, the theory of artificially chipped stones is explained and illustrated, and how, at least in Europe, the evolution through polished and carved implements of stone to those of metal can be traced. A roll-call of scientific work in Argentina, from Pigafetta, Magellan's companion in 1520, to the Princeton University expedition, concludes this introduction of twenty-eight pages.

The palæontological account is greatly helped by a coloured diagram. Besides the mystical Tetrarprothomo, the pliocene Monte hermoso level has yielded pieces of rock which enthusiasts have taken for examples of intentionally fire-baked clay, whilst others refer their condition to volcanic action. In short, the earliest undoubted human remains and traces date from the Enseñada Loess, lowest pleistocene. The *Homo pampeanus*, of the early American type, seems to have used the carapace of the contemporary Glyptodonts for shelter. Post-pampean man was clearly neolithic, and he continued in this state until his discovery by the Spaniards, with the sole exception of the Diaquita in the north-western mountains, which had advanced to the use of bronze. These interesting people are described in the second chapter.

To facilitate the account of the various tribes, each chapter has a little map, and stress is laid upon the

prevailing climate, as influencing man through the fauna and flora. Each chapter begins with a description of the physical aspect of the respective district, whether forest, mountain, or plain, with frequent photographs; the tribes are grouped as much as possible according to their relationship. Each group, or tribe, or race, is tersely characterised physically; as a linguistic point the personal pronouns have been selected. Sociologically: the kind of food and how it is prepared, especial attention being paid to the mode of kindling of fire. Then follow the kind of shelter, dress, ornamentation, dances, creeds, and superstitions, family and funeral rites, weapons, and wars. To each chapter is attached a carefully selected and apparently well-nigh exhaustive bibliography, and 146 illustrations, comprising maps, scenery, implements, pictographs, and portraits enhance the text, which in a small compass manages to impart an astonishing amount of information.

#### OUR BOOK SHELF.

*Solectrics: a Theory Explaining the Causes of Tempests, Seismic and Volcanic Disturbances, and how to Calculate their Time and Place.* By Alfred J. Cooper. Pp. iv+100; illustrated by over 100 diagrams. (London: J. D. Potter, 1910.) Price 10s.

THE "solectric theory" postulates a force which in some sense corresponds to the sun's radiant energy, giving rise to light, heat, chemical action, and magnetism, but the author also inserts gravity and vital force. Having introduced such a force, the author is able to explain the rotation of the earth, the obliquity of the ecliptic, and many other things. This solectric energy penetrates the whole solar system, and there is a constant adjustment of this force according to the configuration of the planets and moon. The sum is constant, the whole passing continually from and to the sun; only local disturbances have to be considered. At intervals the earth becomes charged with solectric energy, both directly from the sun and indirectly from the planets and moon. According to the length of time that the earth is submitted to this force, so its manifestation will vary. If the accumulated energy is spread over a large flat country or an ocean, a storm occurs; if the energy has been gathering for ten or twelve days, and is concentrated in a mountainous district, an earthquake takes place; if the earth has been surcharged for a month or more, volcanic eruptions follow. But whatever the form of the disturbance, it is necessary that the sun or moon should be  $57\frac{1}{2}^{\circ}$  or  $88^{\circ}$  from the position affected at the critical moment.

If we have correctly interpreted the author, this expression means that the place must lie on a circle  $57\frac{1}{2}^{\circ}$  or  $88^{\circ}$  from the position in which the sun or moon is vertical. We have not been able to follow the process by which the position on either of these circles is definitely located, but evidently the operation is not a simple one, for the author intimates that a body of expert calculators will be required in order to apply the theory. But if the instructions are pursued rigorously, it will be possible to issue warnings to any state threatened by an earthquake, or to ships likely to be overtaken by a tempest.

Differing from many theories, the aim here is eminently practical, but if the author entertains any hope that it will be tested, we are afraid he is doomed to disappointment. Though we cannot agree with his conclusions, we should wish to treat Capt. Cooper